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ABSTRACT

The Los Nietos Basic Skills Program was the first program of computer assisted instruction funded by the Emergency School Aid Act (ESAA). The system initially supported 17 typewriter-style terminals, but the number was later increased to 24. Because of software problems, the system changed companies and the courses changed to the following: Elementary Reading Skills (Grades 3-6), Elementary Arithmetic (Grades 1-6), and Elementary Language Arts (Grades 3-6). In the evening hours, the system was used with adult reading, math, and language skills. Computer Assisted Instruction (CAI) takes over the drill and practice function of teaching. In the Los Nietos School District in Los Angeles, CAI is being implemented in 5 schools. Teachers have remarked on the enthusiasm of the children toward the terminals. It seems that pupils who have been the most difficult to handle are particularly attracted to this medium. It also appears that CAI is a valuable medium of instruction in school districts that are in the process of desegregation. (Author/AM)

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Excellence in Social Achievement Affective Learning Academic Growth

Los Nietos School District

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A REPORT OF AN ELEMENTARY INSTRUCTIONAL SYSTEM SUPPORTED WITH COMPUTER-ASSISTED INSTRUCTION IN DRILL AND PRACTICE IN THE BASIC SKILLS

The Los Nietos School District in Los Angeles County has the distinction of being the first school in the United States that has had their basic skills program supported through intensive use of computers.

This publication fulfills the obligation incurred upon receiving a grant under the Emergency School Aid Act; that of dissemination of successful practices for relieving ethnic segregation, and ameliorating the effects of racial isolation.

History of the Project

The Los Nietos ESAA Basic Program was the first program of computer assisted instructional program funded under Public Law 92-318, the Emergency School Aid Act. Approved for the school year 1974-75, the project became operational with the installation of an IBM 370 115 computer dedicated to computer assisted instruction, on January 5, 1975. The system initially supported seventeen 2741 typewriter-style terminals. Before the end of the year this number was increased to twenty-four. The system ran on Coursewriter III, an IBM instructional language, and supported the following courseware:

Arithmetic Proficiency Training Program (Gr. 2 - 9)
Elementary Reading Skills, CCC (Gr. 3 - 6)
WRITE, Poughkeepsie Schools, (Gr. 4 - 9)

Although the early results were excellent, the system was plagued by slow response time and software problems. The necessity to maintain our own software plus the inability of the system to support an adequate number of terminals resulted in the termination of the IBM lease in October, 1976 and a conversion to equipment and programs leased from the Computer Curriculum Corporation, Palo Alto.

We started the year with two CCC A16 computers supporting 64 CRT-type terminals running the following courseware:

Elementary Reading Skills (Gr. 3 - 6)
Elementary Arithmetic (Gr. 1 - 6)

Elementary Language Arts (Gr. 3 - 6)

In the evening hours, the system was used with adult reading, math, and language skills. This was administered under adult education programs.

HOW CAI IS USED TO SUPPORT TEACHERS IN DRILL AND PRACTICE

For the purpose of this subject, let us assume that we accept the following paradigm as the one being used to teach the basic skills:

Step 1. Teachers introduce concepts to children on the basis of their readiness for that particular concept and in a sequence that involves certain prerequisite skills.

Step 2. Upon the child achieving basic comprehension of a concept, the child is given drill and practice to achieve greater understanding and to gain mastery of the concept.

Step 3. Achieving mastery of the skill, the child is given contrived applications, direct purposeful applications, or utility of the skill to master more complex concepts.

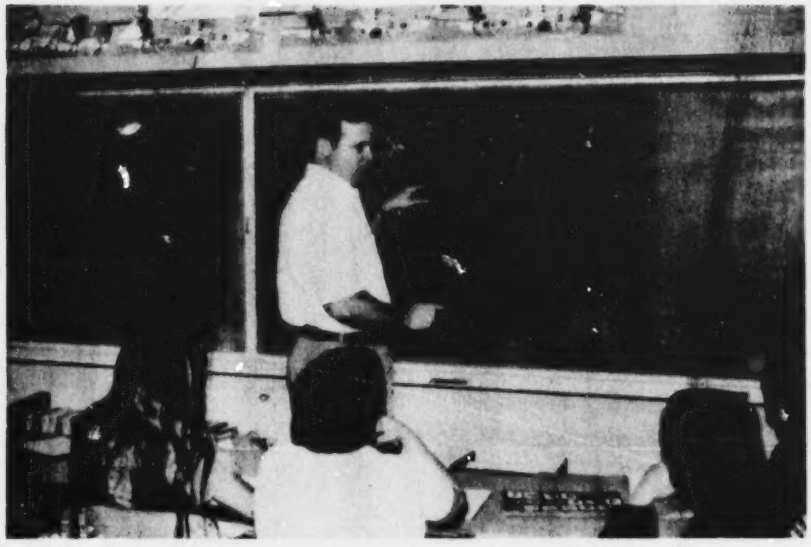
Step 1. Traditionally we think of the teacher explaining the concept (such as contractions in grammar or division in math) with the aid of the blackboard, visuals, or printed matter.

Step 2. The dominant teaching aid for achieving mastery has been the liquid spirit duplicating machine. Teachers pass out exercises for the children to do that are hopefully at their level of achievement. Other aids have been workbooks, teacher made materials, games, and exercises taken from textbooks.

Step 3. The application level can be found in dramatic play of social studies, thought problems from math books, and contrived experiences in the classroom.

Computer Assisted Instruction takes over the function outlined in "Step 2". Computers are uniquely qualified to achieve the aims of drill and practice because they can store and recall vast amounts of information. The programs of computer Curriculum Corporation,

the most widely used software, tract the child in twenty-eight different skill strands simultaneously. When the child achieves ninety percent correct in any one strand, the program advances him. When the child achieves less than eighty percent correct, the pupil is given less demanding work. Thus in a class of thirty pupils, 840 skill strands are being tracked at the same time, daily.



IT STARTS IN THE CLASSROOM The teacher introduces the concept. No computer can come close to the interaction that is necessary for that type of interaction needed for this type of teaching. Other media is usually employed to facilitate communication at this point such as the blackboard, pictures, exhibits, etc.

The children become aware of the concept, gaining the basic knowledge involved, and then move to the level of comprehension.

Gaining comprehension, the children are then ready to begin the process of achieving mastery. Traditionally this is done in the classroom with ditto material, workbooks or copying exercises out of the textbooks.

This has always been a difficult area to individualize work for the child. In a fully integrated heterogenious classroom it becomes a logistical nightmare. Few teachers have the skills, the time, and the commitment to completely individualize in a diagnostic-prescriptive setting.

Where the teacher is highly skilled in communicating and perceiving feedback, the computer is highly skilled at remembering an infinite amount of data, storing this information, and recovering it quickly and accurately.

THE COMPUTER DOES ITS PART Working at grade level initially assigned by the teacher, the pupils do drills and practice on those processes that they comprehend from their classroom work. The children are tracked in as many as twenty-eight skills strands by the computer simultaneously.

This medium appears to have considerable charisma for the children. Some of their comments:

"The terminal does what I tell it to do."

"I know that I did the work myself."

"The computer never bawls me out."

"I get good scores on CAI."

"It's fun."

"Nobody but me knows what I am doing."

"I learn real good on the computer."

"You know that you do it."

"I like to beat the computer."

The children's actions reenforce their words. The terminals are busy during lunch time, before school, after school and during vacation periods.

Parents of primary children often bring their children in after regular hours and sit with them at the terminals.

TEACHER FEEDBACK

In addition to teacher observation of children at work with the terminals, the computer can generate printed reports on demand. These reports show where the child is working in any of the subjects areas, expressed by grade level, e.g., Literal Comprehension 3.7.

The teacher may then refer to the teachers guide for that particular subject and see what concepts the child will need to understand to proceed further. If a teacher notices that a child is not progressing in a particular strand, this is a clue that the pupil lacks real comprehension of the concept.

Class reports are useful in grouping children for small group learning centers to meet common needs. Individual reports are often used to counsel the pupil and in parent conferences.

APPLICATION

After the teacher has received evidence from the computer printouts that the child has achieved mastery of a given skill, it is incumbent on him to assign projects that permit the child to utilize these newly mastered skills so that they have meaning and value.

Newly mastered skills are also utilized as component parts for more highly organized skills that are in reality syntheses of subordinate skills. For example, evidence that the child has mastered vertical subtraction and horizontal multiplication indicates to the teacher that the child has the necessary skills to master division and can begin introduction of this concept.

The retention of any skill mastered is dependent upon review and application; use it or lose it.

WHY CAI IS SUCCESSFUL

Locus of Control

Educators scanning test results of children working with CAI for the first time are struck with an anomoly. They see children who have scored in the lowest quartile suddenly spurt forward. Two or three years growth in one year is the rule for these children rather than the exception.

This is against our past experience and leads us to ask why should they suddenly surge ahead when traditionally they have fallen further behind each year?

The answers to these questions can be found when one examines children from homes with a heritage of poverty in the light of a concept called Locus of Control. This term refers to how the child perceives himself controlled. The internally controlled child perceived that he is in control of his own destiny, that his achievements are usually commensurate with his efforts, and that he can reach most goals that he sets for himself. The externally controlled child believes that his life is controlled by outside forces. He believes that what happens to him is the result of destiny, fate, luck, chance, the intervention of powerful others, or acts of God.

It is quickly evident that the child who perceives that there is no relationship between his own efforts and his achievements is under a tremendous handicap. Many of these children believe that there is no way they can help themselves succeed so they spend their time in trying to avoid failure, thus, removing themselves either physically or psychologically from most learning situations.

The internal child, on the other hand, has learned to savor success. He spends his time putting himself in situations where he can succeed and once again know the pleasure that comes with success.

It appears that internality can be fostered by activities that can 1) allow the child to establish a cause-and-effect relationship with his own actions, and 2) relate these activities without the intervention of a "powerful other" (teacher, aide, parent).

There is a good evidence that reinforcement to learning activities is not effective if the child does not perceive a causal relationship between his own actions and the feedback that occurs. Studies have shown that low achieving children and often minority children perceive themselves as not having much control over their own fate. They perceive what happens to them as a result of who their friends are, what color their skin is, how much money their folks have, luck, etc.

In constructing a social learning theory, J. B. Rotter (1966) stated: "When a reinforcement is perceived by the subject as following some action of his own, but not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredicatable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labeled this a belief in external control. If the person perceives that the event is contingent on his own relatively permanent characteristics, we term this a belief in internal control".

The Coleman Report (1966) found that this belief in destiny was a major determinant in school achievement. They concluded that this pupil attitude factor had a stronger relationship in achievement than all other school factors together.

Computer Assisted Instruction has shown convincing evidence that it is an effective medium for building internal control in the child who believes that his life is controlled by external forces.

The child in question typically has poor tolerance to delayed gratification. He usually sees minimal relationship between his actions of today with success or failure as represented by marks on a report card at a later date. The computer terminal, with its one or two second response time, graphically shows the pupil immediate feedback to his input. He knows he is in control and can readily see the cause and effect relationship to his actions.

Vasquez (1974) sees the understanding of cause-effect relationship as essential to internal attribution of success or failure on the part of the child. This understanding has not been developed adequately in the mind of the external individual because of negative social experiences within a culturally biased classroom. The problem then is how to build understanding of cause-and-effect in the ex-

ternally controlled child.

Vasquez suggests four criteria by which to evaluate activities to accomplish understanding of the cause-effect relationship:

1) See that the cause has sufficient power to produce the effect.
2) Students should comprehend that without the cause, the action or result would not have occurred.
3) Other equally likely causes must not be present if we are to identify a single cause.
4) The cause must precede the event in time.

When judged by the above criteria, Computer Assisted Instruction gets high marks. Let us examine each of the above as compared with CAI.

A) Sufficient power. It is difficult to conceive of any medium that would have more power. Whenever the pupil indicates he has finished his input to the computer, there is almost instantaneous response that is solely related to the input.

B) Cause-effect relationship. On CAI, the child instantly recognizes the relationship of the output to his input.

C) Other causes. The interaction between the child and the terminal is direct, one-to-one without the intervening intermediary of the teacher or others. The child must take full responsibility or credit for the response whatever it is.

D) Temporal relationship. The immediate feedback provided by the computer is unexcelled. The computer responds within one or two seconds to the pupil's input.

There is much research to be done to determine the extent that CAI modifies the locus of control of the minority child. Empirical evidence suggests that there is substantial change. Hard data shows that there is highly significant growth in reading and math as measured by standardized tests. For example, Bone (1974) reported an average growth of 1.1 years growth over an eighth-month period in Chicago's inner city where the average growth had been close to .4 years growth in math for

the period covered. Similar results have been reported from University of Akron, Stanford University, and from Montgomery County, Maryland.

Speculation as to why Computer Assisted Instruction given evidence of increased internality has included the following points:

1) Immediate feedback
2) Lack of external variables to which a student might attribute his success or failure
3) The very specific directions that the computer gives the learner, the computer's low tolerance for deviation from the directions
4) The one-to-one relationship between the learner and the terminal
5) The programmed success that the pupil experiences on most CAI courseware.

Instructional Logistics

Accompanying racial integration in schools, there has been an everwidening span of experiences, competencies, levels of achievement, and ability. In order to effectively teach such diverse groups, teachers have been told to individualize their instruction.

Seldom has there been a harder working group of teachers than those attempting to individualize their classrooms in schools such as we have described above. Despite these heroic efforts, they are unable to meet the goals that they have set for themselves despite special materials, paraprofessional help, subject matter specialists and parent volunteers. Teachers are being overwhelmed by the logistics of instructing such classes. Without special help, teachers are destined to direct the bulk of their instruction towards the mean achievement level of the group. In the past, such instruction has been satisfactory for homogeneous grouping. It is highly inadequate for a school in the process of racial integration as it results in pupil frustration and parent dissatisfaction. Needless to say, the teacher in such a setting is highly upset and can often be found in the personnel office filling out a transfer request.

At first glance, it appears perfectly feasible to individualize these subjects for thirty children. If we only did it with reading and arithmetic it would appear that at most the teacher would have sixty lessons in any one day. This is an illusion. Reading and arithmetic are nothing but names that we have given to a large

assortment of complex skills. Should we break down these subjects into a minimal number of skill areas or "strands", we suddenly find that the teacher has about twenty-five areas to prepare for; and instead of a potential of sixty lessons, it has ballooned to seven hundred and fifty lessons in any one.

What has become an impossible task for the teacher is duck soup for the computer. Thousands of children throughout the nation are having their drill and practice lesson plans prepared for them daily in heterogeneously organized classrooms. They are highly successful. Teachers and parents are pleased at the results that are evident from the child's academic achievement and social adjustment.

Over a thousand terminals are now operating in classrooms of Los Angeles County alone.

In the los Nietos School District, CAI is being implemented in five schools, grades four through eight. Teachers have remarked on the enthusiasm of the children towards the terminals and the change in attitudes that have accompanied the implementation of the program.

Teachers have reported that pupils who have been the most difficult to handle appear to be particularly attracted to the medium of CAI.

Evaluation of an innovation such as this is especially difficult to measure because of the number of uncontrolled variables involved. The following evidence has been observed and appears to have a relationship with CAI.

Scores on standardized test are sharply up.
Truancy and tardiness are down.
Children make intensive use of the computer terminals before and after school.
Vandalism of the school plants is down.

It appears that CAI is a valuable medium of instruction in school districts that are in the process of desegregation. One of the major obstacles has been the achievement of those children suffering the effects of racial isolation is often significantly lower than those children in the majority group. As CAI effectively brings up the achievement level of the lower quartile pupils, there is a reduction in the frustration level, the self-confidence of the pupil improves, and the general emotional climate of the institution is improved.

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